

INSTRUCTIONS

for

AMPLIFIER-SWEEP FOR OSCILLOSCOPE

Cat. No. 90921 - Serial No.

**JAMES MILLEN MFG. CO., INC.
MALDEN, MASS., U. S. A.**

Instructions for 90921

AMPLIFIER-SWEEP FOR OSCILLOSCOPE

1. GENERAL

The Millen No. 90921 Amplifier Sweep is an accessory which may be used with any basic or instrumentation oscilloscope. It contains a 6SJ7 vertical amplifier, a 6SJ7 horizontal amplifier, a 6SN7-GT hard-tube sweep generator which may be applied to the horizontal amplifier, and an internal power supply. The response of each amplifier is ± 2 db from 15 cycles to 125 kilocycles. The gain of each amplifier is approximately 24. Maximum undistorted output from each amplifier is approximately 70 volts peak to peak. The

sweep generator covers 15 cycles to 40 kilocycles in four overlapping ranges. The No. 90921 was designed especially for use with the Millen Nos. 90902, 90903, 90905, and 90905-B oscilloscopes.

For use with oscilloscopes requiring large deflecting voltages, the amplifier plate supply may be increased by connecting a 500 volt external supply to the terminal strip provided on the Amplifier-Sweep. The Millen No. 90905 and 90905-B Oscilloscopes have a 500 volt supply for this purpose.

2. DESCRIPTION

Looking at the face of the panel: the left terminal jack (VERT. INPUT) is for signal input to the vertical amplifier. The lower terminal is grounded. Immediately to the right of the vertical input jack is the vertical gain control (VERT. GAIN), R1, which controls the amplitude of signal applied to the vertical amplifier grid. Clockwise rotation increases input.

(Symbols refer to attached schematic circuit diagram K-90921)

The pilot light, I1, indicating when power is applied to the unit, is to the right and above the vertical gain control. Below the pilot light is a synchronizing voltage selector switch (SYNC.), S4, which selects the synchronizing voltage to be applied to the sweep oscillator. This switch may select external synchronizing voltage (EXT.), from the sync. input jack, internal synchronizing voltage (INT.) from the vertical amplifier, or a voltage at the power line frequency (LINE). At the left center of the panel is the sync. gain control (SYNC.) R17, which controls the amplitude of sync. voltage applied to the sweep generator. Minimum sync. voltage is applied when control is full counter clockwise. The switch in the upper center of the panel (COARSE FREQ.), S2, selects the frequency range for the sweep generator. The lowest frequency range is with the switch full counter clockwise. Frequency increases with clockwise rotation. Directly below the Coarse Freq. switch is the external SYNC. INPUT jack J5. The right terminal is grounded.

At the right center of the panel is the fine frequency control (FINE FREQ.), R13, which controls the sweep generator frequency excursion for each sweep range. Sweep frequency increases with clockwise rotation of the FINE FREQ. control. To the right of and below the FINE FREQ. control is the horizontal amplifier input selector switch, S1, which connects the grid of the horizontal amplifier to the sweep generator in the SWEEP position, and to the external input jack in the AMP. position.

Above the horizontal amplifier input switch is the power switch, S3. When the handle is down, power is removed from the unit and also from the ac outlet, J6, on the rear. When the power cable from the basic oscilloscope with which this unit is used is plugged into J6, the power is switched on and off both units simultaneously by S3. It is not necessary to remember to turn on or off both power switches.

The control at the extreme right of the panel is the horizontal gain control (HOR. GAIN), R8, which controls the amplitude of signal applied to the horizontal amplifier grid. Clockwise rotation increases input.

The right terminal jack (HOR. INPUT), J4, is for signal input to the horizontal amplifier. The lower terminal is grounded.

Looking at the rear of the chassis:

The left terminal jack (HOR.), J3, is connected to the output of the horizontal amplifier, V2. The lower terminal is grounded.

The tube at the left of the chassis is the 6SJ7 horizontal amplifier tube, V2. The 6SN7-GT sweep generator tube, V3, is in the left center. To the right of V3 is the 5Y3-GT rectifier tube, V4. The tube at the right of the chassis is the 6SJ7 vertical amplifier tube, V1.

Directly above V1 is the AC power output jack, J6 (115 V AC), to which the power cable from the basic oscilloscope should be connected.

The right terminal jack (VERT.), J2, is connected to the output of the vertical amplifier, V1. The lower terminal is grounded.

At the lower right corner of the chassis are the power cable and the fuse extractor post. The fuse used should be a type 3AG fuse. Replacement fuses should not be larger than 1 ampere. The power cable should be connected only to a 105-125 volt 50-60 cycle alternating current source.

A three terminal-terminal board, TB1, is provided so that an external high voltage may be used for the plate supply of the amplifier tubes.

Sensitivity With Basic Oscilloscopes

No. 90902 Basic Oscilloscope

Vertical—0.38 volt r.m.s. per centimeter deflection
1.8 volts peak to peak per centimeter deflection
0.97 volt r.m.s. per inch deflection
2.8 volts peak to peak per inch deflection

Horizontal—0.61 volt r.m.s. per centimeter deflection
1.8 volts peak to peak per centimeter deflection
1.6 volt r.m.s. per inch deflection
4.4 volts peak to peak per inch deflection

No. 90903 Basic Oscilloscope

Vertical—0.19 volt r.m.s. per centimeter deflection
0.54 volts peak to peak per centimeter deflection
0.49 volt r.m.s. per inch deflection
1.4 volts peak to peak per inch deflection

Horizontal—0.25 volt r.m.s. per centimeter deflection
0.71 volt peak to peak per centimeter deflection
0.64 volt r.m.s. per inch deflection
1.8 volts peak to peak per inch deflection

No. 90905 Basic Oscilloscope

Vertical—0.25 to 0.28 volt r.m.s. per centimeter deflection
0.71 to 0.80 volt peak to peak per centimeter deflection
0.64 to 0.72 volt r.m.s. per inch deflection
1.8 to 2.1 volts peak to peak per inch deflection

Horizontal—0.29 to 0.33 volt r.m.s. per centimeter deflection
0.83 to 0.94 volt peak to peak per centimeter deflection
0.74 to 0.84 volt r.m.s. per inch deflection
2.1 to 2.4 volts peak to peak per inch deflection

No. 90905-B

Vertical—0.17 to 0.19 volt r.m.s. per centimeter deflection
0.49 to 0.54 volt peak to peak per centimeter deflection
0.44 to 0.49 volt r.m.s. per inch deflection

Horizontal—0.26 to 0.28 volt r.m.s. per centimeter deflection
0.74 to 0.80 volt peak to peak per centimeter deflection
0.66 to 0.72 volt r.m.s. per inch deflection
1.9 to 2.1 volts peak to peak per inch deflection

Sweep

Type: Hard Tube
Range: 15 cycles to 40 kilocycles
Synchronization: Internal
Line Frequency
External

Power Supply

105-125 volts, 50/60 cycles
Power Consumption, 32 watts
Fuse Size, 1 ampere

Tube Complement

1—6SJ7 Vertical Amplifier Tube
1—6SJ7 Horizontal Amplifier Tube
1—6SN7-GT Sweep Generator Tube
1—5Y3-GT Rectifier Tube

Panel Controls

Vertical Gain
Horizontal Gain
Coarse Sweep Frequency
Fine Sweep Frequency
Sync. Gain
Horizontal Select
Power On-Off
Sync. Select

Physical Data

Height—5 $\frac{1}{4}$ inches
Width—19 inches
Depth—8 $\frac{3}{8}$ inches overall (including tubes)
Weight—13 pounds
The No. 90921 Amplifier-Sweep mounts in a standard 19 inch rack

3. INSTALLATION

The 90921 Amplifier-Sweep unit may be mounted either above or below the basic oscilloscope with which it is to be used. Since the cathode ray tube in all Millen oscilloscopes is thoroughly shielded, no difficulty with magnetic hum is experienced regardless of the relative placement of the equipment used with the oscilloscopes. If the Amplifier-Sweep is mounted below the oscilloscope, the connecting leads will be slightly shorter. Standard Millen 37212 plugs are supplied for each jack on the unit so that convenient cables may be made. Since the Amplifier unit is generally near the oscilloscope, unshielded twisted leads may be used. Long shielded leads are to be avoided, because of the additional capacity which they add across the output. Added capacity reduces the high frequency response of the overall system. Hum pickup in short unshielded connection leads is un-

likely because the signal level at this point is relatively high.

The power cable from the basic oscilloscope should be plugged into J6. J6 is not fused. Any external equipment plugged into J6 should be fused.

If a 90903 3 inch basic oscilloscope is used with the Amplifier unit, the overall high frequency responses of the system may be improved by replacing the shielded leads to the deflection plates by unshielded leads. The shielding is desirable to prevent hum pickup because of the high input impedance when the oscilloscope is used by itself.

When the amplifier unit is used with a two or three inch oscilloscope the B and PLATE terminals on TB1 should be jumped together. For use with a 5 inch oscilloscope see section 5.

4. OPERATION

The operation of the combined 90921 Amplifier-Sweep unit and a basic oscilloscope is the same as the conventional oscilloscope with amplifier and sweep. The HOR. INPUT switch on

the oscilloscope should be switched to EXT. so that the amplified sweep or voltage applied to the oscilloscope external input jack is applied to the deflection plates.

5. USE WITH 5 INCH OSCILLOSCOPES

When the amplifier unit is used with a 5 inch oscilloscope, it is desirable to use a higher voltage supply to the two amplifier plates. This will make available a higher undistorted output signal amplitude.

TB1 on the rear of the amplifier-sweep unit is provided so that higher voltage may be supplied from an external supply. When an external plate supply is to be used, remove the jumper from the B and PLATE terminals on TB1 (be certain the power switch is off). Apply the external positive voltage to the PLATE terminal and the external negative lead to the GND. terminal on TB1.

The Millen No. 90905 and 90905-B Basic Oscilloscopes have a 500 volt power supply which is intended for use with the No. 90921 Amplifier-Sweep unit. When the No. 90921 is used in conjunction with the No. 90905, connect the D. C. +

terminal of TB5 on the No. 90905 to the PLATE terminal on the amplifier unit and connect the GND. terminals on the two units together. Interconnection to use the 500 volt supply in the No. 90905-B is made in the same manner.

The undistorted output of the amplifier unit is more than enough for seven inches of vertical deflection on the No. 90905 or No. 90905-B Basic Oscilloscopes when using the 500 volt supply from the oscilloscopes.

The vertical sensitivity of the No. 90921 and the No. 90905 combination is 0.7 volt r.m.s. per inch deflection. The horizontal sensitivity is 0.8 volts per inch deflection.

The vertical sensitivity of the No. 90921 and the No. 90905-B combination is 0.5 volt r.m.s. per inch deflection. The horizontal sensitivity is 0.7 volt r.m.s. per inch deflection.

6. TECHNICAL SUMMARY

Frequency Response

Vertical

15 cycles to 125 KC \pm 2 db.

Horizontal

15 cycles to 125 KC \pm 2 db.

Gain

Vertical—24

Horizontal—24

Maximum Undistorted Output Voltage

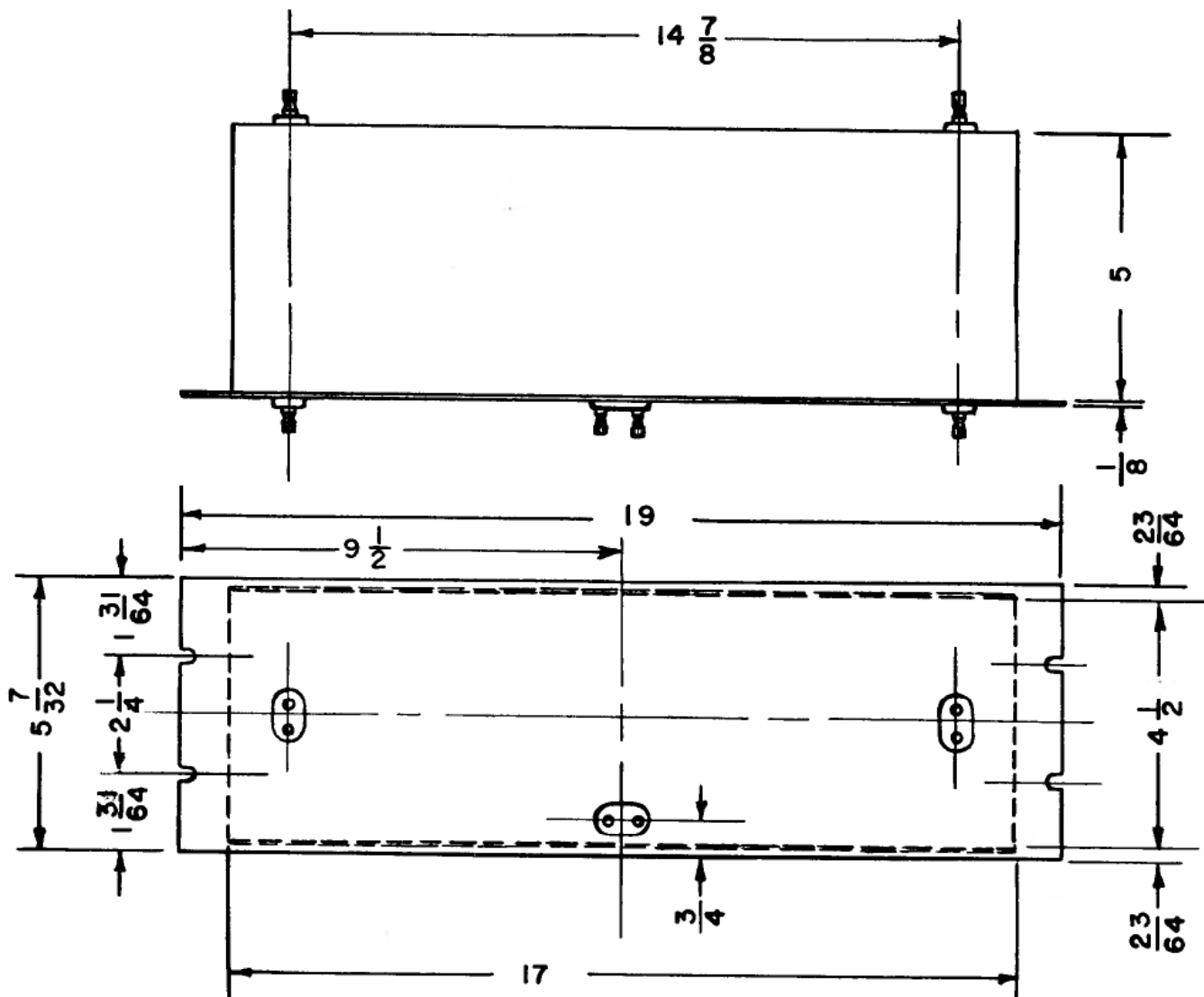
Internal Plate Supply

70 volts peak to peak

Plate Supply from No. 90905 or No. 90905-B Basic Oscilloscopes

380 volts peak to peak. (Enough for seven inches vertical deflection on the No. 90905 or No. 90905-B Basic Oscilloscopes)

THIRD ANGLE PROJECTION



ALL DIMENSIONS UNLESS OTHERWISE NOTED MUST BE HELD TO A TOLERANCE OF

OUTLINE DIMENSIONS

FIRST MADE FOR SWEEP AMPLIFIER

DESIGNED BY _____
DRAWN BY H. COTTERLY

CHECKED BY P. G. E.
APPROVED _____

JAMES MILLEN MFG. CO., INC.
MALDEN, MASS., U.S.A.

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